CRYPTOZOOLOGY

VOL. 7 1988

Cryptozoology, 7, 1988, 1–21
© 1988 International Society of Cryptozoology

THE SOURCES AND METHOD OF CRYPTOZOOLOGICAL RESEARCH

BERNARD HEUVELMANS
9, Allée des Acacias, 78110 Le Vésinet, France

ABSTRACT: "Hidden" animals, with which cryptozoology is concerned, are by definition very incompletely known. To gain more credence, they have to be documented as carefully and exhaustively as possible by a search throughout the most diverse fields of knowledge. Cryptozoological research thus requires not only a thorough grasp of most of the zoological sciences, including, of course, physical anthropology, but also a certain training in such extraneous branches of knowledge as mythology, linguistics, archaeology, and history. It will consequently be conducted more extensively in libraries, newspaper morgues, regional archives, museums, art galleries, laboratories, and zoological parks, rather than in the field.

If proper cryptozoological work entails an exceptionally wide scope of multidisciplinary competence, the actual multifariousness of the tasks it involves implies that, according to his or her personal educational background, specialization, skill, or inclination, *anybody* interested in cryptozoology may contribute to its progress.

The purpose of the present paper is to assist all those concerned, not only by briefly outlining the right procedures to follow and suggesting the best sources of information, but also by delineating some promising areas to prospect, as well as matters deserving special consideration. To emphasize the extreme versatility of cryptozoology, this paper is deliberately expressed in a forensic perspective, rather than in a strictly zoological one.

INTRODUCTION

As various definitions of cryptozoology have been proposed which are either incomplete or overelaborate, fancy or quite erroneous, it would not be superfluous to first reassert what this discipline of science really is. It should, incidentally, be recalled that he or she who coins a new term has the privilege of choosing its meaning, provided it conforms to the etymology of the word.

As its name implies, being coined from the Greek roots *kryptos* (hidden), *zoon* (animal), and *logos* (discourse), cryptozoology is the science which deals with hidden animals. "Hidden" animals here refers to animal forms (species or subspecies) still unknown to, or undescribed by, traditional zoology (ac-

tually, unrecognized by a consensus of its representatives) because their asserted or alleged existence is supported by testimonial and circumstantial evidence only, or even by autoptical (i.e., material) evidence considered insufficient by some. Or, briefly, as it would appear in a dictionary: "The scientific study of hidden animals, i.e., of still unknown animal forms about which only testimonial and circumstantial evidence is available, or material evidence considered insufficient by some."

Neither more nor less. This strict definition encompasses all possible objects of cryptozoological research, and these objects only to the exclusion of all others (Heuvelmans 1987a).

The animal forms within which some of these "hidden" animals can be classified may admittedly be well known to zoologists or paleontologists. In these instances, it is their presence in a certain geographical area, or at a certain period of history (at the present time, for instance), which is not generally accepted. Representatives of a known species reported persistently in an unexpected region, belong perforce to at least a new geographical race; that is, a new subspecies. And representatives of a known species supposed to have become distinct during a past geological epoch have continued to evolve since the time of their alleged disappearance, and thus belong to another form: usually a new species, but sometimes a new genus. Both of these apparently alien or achronistic forms of known animals are to be considered unrecorded, unknown, or, better still, *well-hidden* species or subspecies, and thus fall within the scope of cryptozoology as defined above.

Outline of the Cryptozoological Method

What cryptozoology aims at is essentially the scientific description and naming of the aforesaid "hidden animals" as recognizable species or subspecies, which could eventually receive legal protection if threatened with extinction. It aims accessorily at a systematized search for specimens of these animal forms, which, if successful, would make them pass from a cryptozoological status to a zoological status.

To achieve these purposes, as far as any particular "hidden" animal is concerned, the cryptozoologist has first of all to patiently and doggedly collect the available evidence from all possible sources, then analyze these heterogeneous data, compare them, sift them (eliminating patent hoaxes, misidentifications of known animals or phenomena, and confusions with other unknown animals, by reducing exaggerations, and by deleting fantastic traits borrowed from mythological models), make them complementary to each other, and, finally, produce a coherent, consistent synthesis of them. Thus, by resorting to all and sundry resources of the zoological sciences, but also of extraneous branches of knowledge such as mythology and folklore, linguistics and semantics, archaeology and history, the cryptozoologist can endeavor to build up a sort of identikit-picture of the relevant animal,

including not only the anatomical traits which characterize its morphology, but also information on its physiology, behavior, ecology, and geographical distribution.

Thus, he or she will finally be able to identify the animal with some precision; that is, to classify it with some accuracy within the categories of the natural system, and perhaps even give it a legitimate scientific name. (For a detailed treatment of the whole procedure, see Heuvelmans 1965, 1968.)

This is where proper cryptozoological work ends, because, from that time forth, *any* laymen well informed about the cryptozoologist's conclusions—but preferably a skilled and well-trained tracker, animal catcher, gamekeeper, or hunter—will have a clear idea of where, and in which surroundings, to search for the animal in question, and what kind of tracks or other traces it is likely to leave of its presence; how to recognize it once sighted, even dimly; knowing the best time of day and which season for approaching it; knowing with which specific bait it can most plausibly be lured into a trap, a snare, a pitfall, or a net, and thus be captured—even if only on film—or just temporarily immobilized; knowing the time required for proper scientific inspection (the taking of photographs and measurements, the collection of samples, the performing of tests); and, ideally, determining if it is possible to establish a friendly—or at least pacific—relationship with it, and hence study it at leisure.

The whole process of cryptozoological work can best be compared with legal proceedings, with apparently unknown animals put on trial, a traditional, conservative zoologist acting as the public prosecutor, and the cryptozoologist as the counsel for the defense. To plead his case—for the enlightenment of his fellow zoologists, concerned conservationists, possible workers in the field, or potential sponsors—the defending cryptozoologist has to adduce evidence in support of his claims. Just as in a court of law, he should produce witnesses and documents, invoke circumstantial evidence, exhibit material proof if some is at hand, successfully argue all objections which are liable to be raised, and cite precedents. Unless the case has to be dismissed—at least provisionally—for lack of sufficient or unequivocal evidence, the cryptozoologist should be able to assign reasons for all relevant phenomena, introduce suggestions as to the identity of his "client," and offer pleas for its hearty reception within the community of known animals.

Let us review seriatim which tasks he must perform to achieve these goals, and hopefully win his case.

The Search for Testimonial Evidence

To find testimonial evidence supporting his case, the cryptozoologist has initially to consult the collections of newspapers, magazines and/or scientific

journals from all those countries in which articles may have been published reporting local rumors about the existence of the relevant animal; actual sightings of it, dead or alive; possibly an actual fight or physical encounter with it; the discovery of its supposed tracks or other material traces; or the result of its alleged predatory incursions or other depredations.

If such reports are recent enough, and if the names of the eyewitnesses have been duly recorded, the investigating cryptozoologist should endeavor to contact them directly, request a first-hand and detailed account (with relevant sketches), and then ask them specific questions—without, however, trying to influence them, and run the risk of distorting their testimony.

The perusal of collections of newspapers year after year is, of course, a most time-consuming, thankless, and often boring task, and the journalistic information it can produce is, moreover, of a less reliable nature. It is, nevertheless, the most rewarding search for testimonial evidence one can wish for, since—unless one has been informed personally—it is practically the only way of collecting the initial clues which enable further and more thorough investigation; namely, in the field.

From the classic *The Great Sea Serpent* by Oudemans (1892) to the recent volume *The Enigma of Loch Ness* by Henry H. Bauer (1986), the best documented works on cryptozoology always mention as many relevant newspaper articles as possible. For the most recent ones, this is often the result of the unobtrusive ants' work achieved by dedicated researchers who have preceded or helped their authors. So, one could never praise highly enough such individuals as the late George F. Haas (1906–78), editor of the *Bigfoot Bulletin* (1969–71), and his successor Warren Thompson, for their obstinate collecting of data on Sasquatch and other unknown hominoids, which have been regularly published since 1975 in their *Bigfoot Bibliography*.

Appreciation should also be extended to Gary S. Mangiacopra for scanning the collections in old newspaper morgues in the eastern U.S.A. in search of information about marine "monsters" (and incidentally some lake "monsters"), which resulted in a series of well-documented articles published from 1975 on in *Of Sea and Shore* magazine. Similar systematic quests, which will almost certainly prove as fruitful, have more recently been undertaken for the aquatic "monsters" of the West Coast of Canada by James Clark of Coquitlam, British Columbia, and for all unknown or fabulous animals reported in the state of Maryland by Mark Opsasnick of Greenbelt. It is to be hoped, for the sake of cryptozoology, that such enterprises will become increasingly frequent in the future, as they provide us with the basic building materials of our discipline.

Fortunately for cryptozoology, the more faithful disciples of the great Charles Hoyt Fort (1874–1932), tongue-in-cheek philosopher of science and collector of anomalous events extraordinaire, followed the path opened by him, and, at an early date, began to publish the latest reports on anomalous

animals. In this respect, the richest veins of cryptozoological news have been essential Fortean publications, to wit: *Doubt* (originally *Fortean Society Magazine*) (1937–59), *INFO Journal* (1967–present), *Pursuit* (1967–present), and the new *Strange Magazine* (1987–present), in the United States. It is actually *Fate* (1948–present) which has published by far the greatest number of articles of cryptozoological interest in the United States, but, unfortunately, the original sources are seldom cited. In the United Kingdom, it has been the *Fortean Times* (originally *The News*) (1973–present), and, in Canada, the (alas) defunct *Res Bureaux Bulletin* (1976–80).

Two one-man newsletters on unknown animals are now also disseminated from Continental Europe: Jean-Jacques Barloy's *Enquête sur le Serpent-de-Mer et les Animaux Mystérieux* (1978–present) in France, and Ulrich Magin's *BILK Magazine* (1985–present) in West Germany, which deals mainly with aquatic "monsters." Both these publications list much data irrelevant to cryptozoology, are in the habit of quoting one another, and report much third-hand information borrowed from other cryptozoological and Fortean periodicals. The former sometimes mentions first-hand information, but it is so vague as to be almost impossible to trace or check. Both publications are, however, worth consulting, as they occasionally give an interesting lead; a good tip should never be neglected.

The More the Heavier

Needless to say, the more witnesses who can be produced for each particular sighting—and, in the long run, for each kind of hidden animal—the stronger the case. Essentially, this is because an abundance and unanimity of testimonies has perforce greater weight. Sir Arthur Conan Doyle (1859–1930) once expressed this, much to the point (more so when one kindly replaces "shot" by "seen" in his statement): "If, for example, an okapi had only once been shot in Africa, its existence on the evidence of a single sportsman might reasonably be doubted. If 10 men agreed that they had shot such a creature, the evidence would be strong. If 50 had done so, it would become convincing. This is common sense" (Doyle 1919). It should be stressed here, incidentally, that scientific "truth" is, as a matter of fact, *always* statistical.

Accordingly, the inquiring cryptozoologist should endeavor, as his first important task in the field, to collect as many eyewitness testimonies as possible, but also to attempt to trace in libraries similar reports from former times, and even from the remotest past—not to mention traditions about the relevant animals which may have been current throughout history.

Information of this kind can be found in such varied documents as the Chaldean *Epic of Gilgamesh,* the Old Testament, and the commentaries of the Fathers of the Church; the writings of the first naturalists and encyclopedists of both classical and oriental antiquity; the Medieval bestiaries,

generated by the original *Physiologus*; the works of the three Dominican friars of the 13th century, who attempted to summarize all that was then known about zoology: Vincent of Beauvais, Albertus Magnus, and Thomas of Cantimpré; the accounts of the Moslem geographers and naturalists of the Middle Ages; the subsequent encyclopedias of the erudite compilers of the Renaissance, from Edward Wotton and Conrad Gesner to Jan Jonston and Father Juan Eusebio Nieremberg; the ancient chronicles of the countries where the relevant "hidden" animals are now said to dwell, be it on land, in lakes and rivers, or in the contiguous sea; the accounts of the early explorers, missionaries and merchants concerning all these regions; the later narratives of travelers, and, more especially, of wandering naturalists; the zoological treatises of the 18th and 19th centuries, both scholarly and popular, from Buffon, Cuvier, and Linnaeus to Jardine, Chenu, and Lydekker; and, finally, the more recent reports of zoological expeditions, the memoirs of colonial administrators and soldiers, game wardens and scouts, hunters and fishermen, farmers and stockbreeders—essentially, of *all* people interested even casually in wild animals.

All this requires, of course, intensive bibliographical research, for which the best guide is the fundamental opus *An Introduction to the Literature of Vertebrate Zoology* by Casey A. Wood (1931). This volume is even useful for the study of the few unknown invertebrates involved in cryptozoology, as it mentions all general treatises on the world's fauna. Moreover, it lists several prominent works of the travel and exploration literature, which has, of course, to be thoroughly reviewed. To achieve this herculean task, the following works should prove extremely helpful for the English-speaking researcher: *A Reference Guide to the Literature of Travel,* by Edward Godfrey Cox (1935–38), and Volume I (*Voyages and Travel*) of *National Maritime Museum: Catalogue of the Library* (Anonymous 1968).

The greatest part of this systematic bibliographical search has already been accomplished by the author himself during 40 years of constant, uninterrupted work. The references I have found have been duly cited in the relevant bibliographies of my published works. However, as the latter are far from covering all and sundry cryptozoological problems, which I tentatively reviewed in a checklist (Heuvelmans 1986), others will have to patiently wait for the author's further writings to obtain knowledge of the numerous remaining references. In the meantime, it will be necessary for others to find these for themselves by following the general lines which I have set out here. The diligent researcher may even uncover texts which have escaped my attention during a long and lonely quest. It certainly makes such bibliographic discoveries the more exciting when one knows that they are becoming rarer and rarer as work progresses.

Mercifully, the gathering of data, whether recent or ancient, is getting better organized and easier every year. So, to those interested in cryptozoology who feel ready to undertake the indispensable documenting task its research implies, I highly recommend a remarkably concise summary, by Scott Parker, of the correct procedures to be followed (Parker 1988).

The Search for Circumstantial Evidence

The hitherto mentioned sources are not only liable to yield more or less detailed accounts of actual sightings of apparently unknown animals, they may also contain a wealth of matter-of-fact data which can sometimes be used as circumstantial evidence.

This kind of evidence can assume the most diverse forms. Henry Thoreau (1817–62) wrote in his *Journal,* in November, 1850: "Some circumstantial evidence is very strong, as when you find a trout in the milk." Now, to find in the African rain forest a pygmy hunter describing casually a saber-toothed predator, or what sounds very much like a sauropod dinosaur, or to discover in a Spanish fishermen's church a silver ex-voto representing a coelacanth, forged long before this Devonian fish was discovered alive in 1938, this is, by all means, strong circumstantial evidence.

Of course, the less ancient the information one obtains on a "hidden" animal, the more convincing it is. When it is rather remote, the possibility always remains that the form in question has, in the meantime, died out. All the same, the alleged existence nowadays of any particular species of animal is assuredly supported in an indirect way by its acknowledged presence in the same area in former times, especially when this has been unequivocally established by the fossil record.

The further persistence of the relevant form up to more recent times can possibly be gathered from the evidence of prehistoric representations of it (drawings, paintings, engravings, carvings and sculptures), which would demonstrate, furthermore, that it was also contemporaneous with man in the past. This is particularly important when the depicted animal is thought by paleontologists to have died out during bygone geological periods, long before the coming of *Homo sapiens.*

Finally, the survival into historical times of such "prehistoric" animals, or even of more recent forms fallen into oblivion during the Pleistocene, can similarly be inferred from later works of art, starting with the treasures of antiquity through the most modern productions. In this perspective one should consult the classic opus *Die Antike Tierwelt* by Otto Keller (1909), *Animals in Archaeology* by Houghton Broderick (ed.) (1972) and *Die Zoologische Buchillustration* by Claus Nissen (1972). As K'ung Fu-tze, better known as Confucius (who lived around 551–479 B.C.), once put it: "An image is worth more than a thousand words."

A thorough investigation of the paleontological, prehistorical, and archaeological records is thus required of the conscientious cryptozoologist, in addition to his mastery of written sources. (It should be noted that, in

certain countries, namely French-speaking ones, one often distinguishes between prehistorical archaeology, labeled simply "prehistory," and historical or classical archaeology—history starting with the written record. This is at least partly due to the fact that two kinds of cultural relics and remains are studied by people with quite different backgrounds, the former having been trained as anthropologists, and the latter as historians.) A careful scrutiny of old maps, on which animals reported by travelers are sometimes drawn, can also be enlightening. In this connection, one could read *Animals and Maps* by Wilma George (1969).

In a comparative study of depictions of cetaceans in both cave art and ancient Scandinavian sketches, Lucie Arvy (1978) summarized the situation thusly: "The extinct faunas escape us. To imagine them we have only three kinds of data at our disposal: archaeological, rupestral [from rock art], and descriptive." This is also true, of course, for animals *supposedly* extinct, but which actually survived beyond their alleged date of disappearance, possibly until the present time.

Most animals, even the rarest and most elusive ones, are more or less familiar to the native people who share their habitat or live in or near their range. They are, to put it briefly, native-known, or, if one wishes to use scientific jargon, ethnognostic. Therefore, more circumstantial evidence can be extracted by the cryptozoologist from ethnographical sources. Needless to say, the asserted existence of an animal form by aboriginal or indigenous people can but strongly support the reports of travelers who claim to have had chance encounters with one of its representatives.

When, in Central Asia, for instance, a local hunter casually lists among the game a wild man, as well as a wild horse and a wild camel, one should seriously start wondering whether the extant rumors about creatures looking like reconstructions of prehistoric men are not founded, after all, upon reality.

As in the case of "hidden" animals, of which ancient depictions vouch for their past presence in a certain region, modern works of native art can also betray the present existence of some. The alleged survival of dinosaurs in Central Africa is not only supported indirectly by a Babylonian bas-relief of the Ishtar Gate depicting the Mesopotamian dragon or *sirrush*—a rather distorted version of an ornithopod dinosaur—it is supported much more directly by the recent use, by the Ashanti of West Africa, of small gold-weights representing totemistic animals, one of them being a long-necked quadruped with a reptile's head—which can hardly be anything else but a sauropod dinosaur (Heuvelmans 1978).

The Importance of Animalists

The prime importance of a systematic survey of both ancient and recent items from the iconographic record has been emphasized as early as 1955 by the author: "All too often zoologists make the mistake of underestimating

ancient or primitive art as a source of investigation" (the original French version was slightly different, as it spoke of ancient and *exotic* art) (Heuvelmans 1955, 1958).

This was particularly true of paleontologists, and some of them soon realized it. In 1968, for instance, F. Prat claimed that, in studying prehistoric depictions of European horses, he was able, based on anatomical criteria, to identify two distinct morphological types corresponding to subspecies—*Equus caballus germanicus* and *E. c. gallicus*—and possibly a third, ill-defined, rarer, and more doubtful one. He went so far as to suggest: "It is finally not impossible that the prehistoric artist has seen and depicted forms still unknown to paleontology" (Prat 1968).

Ten years later, in a survey of the paleolithic engravings on pebbles and bones from La Colombière (Ain, France), Martine Faure (1978) commented on this daring suggestion by stating that it "would certainly not have been denied by zoologist B. Heuvelmans." To support the importance of Quaternary art in the reconstruction of past faunas, she then reviewed an impressive array of prehistoric works, which not only corroborated the findings of paleontology but often completed and preceded them. After all, was it not the discovery of pictures of "ante-diluvian" animals that first proved their contemporaneity with man, and thus started the great 19th-century controversy over "fossil man," then considered unacceptable by the scientific establishment? It all happened, Faure recalled, just as the author first showed in 1955 in his book *Sur la Piste des Bêtes Ignorées* [On the Track of Unknown Animals], "how works of art have been able to confirm the existence of certain animal species until then unknown." She illustrated this by the examples I had given of the earliest known representatives of the gerenuk or giraffe-necked gazelle, the okapi, and Grévy's zebra, which preceded by centuries and even millenia their scientific descriptions. Finally, she drew my own attention to several intriguing but suggestive animal depictions of prehistoric art, including apparently achronistic saber-toothed cats and woolly rhinoceroses.

Incidentally, ancient representations of animals discovered far from their known range today do not necessarily imply a broader range in the past. They sometimes betray unsuspected relations, either commercial or cultural, between peoples living in lands rather distant from one another: as, for instance, a bas-relief of an indisputable cassowary (*Casuarius casuarius*) from a temple near Wadjak, in eastern Java, and another one of a man-sized moa (*Euryapteryx*?), squeezed between a rhinoceros and a buffalo, from the main temple of Angkor, built around 1200 A.D. in Cambodia (Koenigswald and Steinbacher 1986). The latter, of course, throws some light on the early migrations of the Maoris, as well as on the time of survival of some of the gigantic birds of New Zealand.

More recently, our thanks go to Christine Janis for having started scanning

the archaeological record in search of representations of fossil ungulate mammals generally thought extinct before the coming of modern man. Her first, brilliant contribution to cryptozoology (Janis 1987) opens the road to a most promising outlook.

The benefits science can reap from cryptozoological research can best be appraised by recalling the story of the discovery of the mammoth. Its existence was only disclosed, at the end of the 18th century, by the unearthing of fossil bones, but it was not before the last century that the examination in Siberia of whole carcasses preserved in permafrost informed us of its outer appearance. All the same, excellent depictions of this huge animal could already have been beheld at least as early as the 16th century, in the cave of Rouffignac (Dordogne, France), for instance, now famed as "la grotte aux cents mammouths" [the grotto with the hundred mammoths]. That this cave was visited at least as early as the Middle Ages is vouched for by François de Belleforest (1530–83), when he states in his *Cosmographie Universelle* that, in the "Cro du Cluzeau" (its former name), which he describes at length, ". . . on voit quelques autels, et des paintures en plusieurs endroits" [one can see a few altars, and in several places some paintings] (Belleforest 1575).

Now, by gazing at the latter, a naturalist with a cryptozoological turn of mind would have been led to conclude that, in former times, "hairy elephants" roamed about the countryside. No doubt this would have made him the laughing-stock of the zoological community, but time would have rendered him justice, and he would now be considered a pioneer of genius, one of the forerunners of paleontology.

Resorting to Linguistics

Since every conspicuous animal, down to the smallest one, is generally native-known, it will accordingly have been given a vernacular name, stressing as usual its more striking characteristics, or even several such names, particularly where different cultures meet or overlap within the geographical range of the animal. When one wants to collect more circumstantial evidence, therefore, resorting to linguistics and semantics can, at times, be extremely rewarding.

Take, for instance, the names given in many different countries of Eurasia to puzzling hairy hominoids, which Western scientists and their followers would be tempted, in a Darwinian perspective, to call "ape-men," "pre-men," "sub-men," or—why not?—"missing links." Since, on the one hand, there are no apes in these regions, and as the small, local monkeys look more like little cats than like men (whence such popular names as the Italian *marcati* and the German *Meerkatzen,* meaning "cats of [beyond] the seas"), and since, on the other hand, bears are common in these regions, and resemble big furry men when they occasionally stand up, it is not amazing that the said hominoids are almost everywhere known as "bear-men": namely *mi-dred* or *mi-teh* in Tibetan, *iu-wun* in Burmese, *ren-xiong* in Chinese, and *chelovek-medvied,* or rather, more familiarly, *chelovek-mishka* in Russian.

This shows very clearly that these vernacular names, given spontaneously, are quite original, meaningful, and probably very ancient: they can obviously not have been influenced by either modern scientific theories or the latest fashions of journalism. Thus, the creatures they are unanimously and perennially applied to, do not stand open to question or doubt, to hoaxes or occasional cases of mistaken identity.

There is, of course, much more to extract from linguistics and semantics in support of some cryptozoological cases. In this regard, it is to be hoped that we will soon see in print the well-documented and enlightening paper presented by Polish philologist Piotr Klafkowski (now living in Norway) at the symposium "Cryptozoology: The Search for Unknown or Supposedly Extinct Animals," III International Congress of Systematic and Evolutionary Biology, held in Brighton, England, in July of 1985 (Klafkowski 1985).

The Pervasion of Knowledge by Myth

The last source of ethnological information where circumstantial evidence can be gleaned by the cryptozoologist is, of all places, mythology. The main reference works to be consulted in this connection are those of Edward B. Tylor (1871), James G. Frazer (1890), James Hastings (1908–22), Antti Aarne (1928), John Arnott MacCulloch, L. H. Gray, and G. F. Moore (1916–31), Stith Thompson (1932–36), Maria Leach (1949–50), Ad. De Vries (1974), and Joseph Campbell (1984).

It cannot be too often repeated that "mythic" should never be used as synonymous with "fictitious"; on the contrary, it generally refers to what is thought to be fundamentally true (Heuvelmans 1982). It would seem that any information from the outside world received through our senses, when passing that part of the central nervous system sometimes called the "emotional brain," is systematically distorted and completed according to deeply embedded mental stereotypes in such a way that it loses the frightening nature of the unknown, and, having thus become more familiar, is accepted without the risk of harming the mind's balance and comfort. This is what one calls the process of mythification: the depth and scope of its action varies in direct proportion to the extent of our ignorance.

Unknown animals are actually *very incompletely known* animals. As they have to be largely mythicized to compensate for the disquieting gaps in our knowledge, their shape and behavior are subtly distorted according to the mythical "monster" they best fit, and some of their attributes are borrowed from it.

The archetype in question is, in accordance with the circumstances, the old devilish sea serpent; the tentacular island-beast or Kraken; the beguiling

mermaid (much less often her bearded companion); the evil Western dragon; the benevolent Eastern dragon; the crowing, crested Basilisk; the ravenous beast or werewolf; the ithyphallic-intended unicorn; the hedonistic wild hairy man or satyr; the men-enslaving Amazon; the oversexed hermaphrodite; the child-eating ogre or bogey-man; the goblin or cooperative denizen of the little people's underworld; the kidnapping Roc-Bird or sternly watching Thunder-Bird; the endlessly resuscitating phoenix; the multiweaponed, almost invulnerable griffin; the bloodsucking and eternity-seeking vampire; or the lake monster, custodian of sunken treasures, but also of unspeakable lusts. Each of these features is specifically linked with one or another of our psychological problems.

This explains why "hidden" animals are generally adorned with fantastic and even supernatural traits, which make them less credible or, frankly, unacceptable to sober-minded scientists. It is, however, by virtue of a universal mental process that these flesh-and-blood animals are fatefully transmogrified into fabulous beasts (Heuvelmans 1983a, 1987b).

One of the main tasks of cryptozoology is the attempt to strip off of the resulting "monsters" those attributes which have been borrowed from their mythological models, and which are often easily recognizable because of their stereotyped nature. For example, in former days the orang-utan and the gorilla were slanderously accused of being bloodthirsty brutes eager to abduct and rape women: this supposed behavior was simply to conform to the archetypal image of the "wild man of the woods," or satyr. The Yeti, or Abominable Snowman, is presently surrounded—obviously for the same reason—by an aura of violence and lubricity: the rumor has it that this creature, which is said to walk erect like man, can knock down yaks with a blow from one of its fists, can rip them open with its claws, and will devour their steaming bowels. It gulps down the eyeballs—or the testicles—of the men it kills, and never fails to abuse young girls.

Some natives also report that the mysterious Himalayan creature, which runs on all fours when hurried, feeds mainly on small mammals, such as marmots and pikas (or "mouse-hares"), and on large insects, besides consuming "clay-like earth, perhaps for bulk or some mineral value" (Izzard 1955: 106). It has also been reported that it is partial to some saline moss, which it scrapes from the rocks on the moraine fields. It would be while searching for this delicacy (probably rich in vitamins) that it leaves its tracks on the snow fields before returning to the rhododendron forests, in which it must normally hide.

In front of this heap of information on the mores of the alleged "snowman," it does not take much shrewdness to separate the wheat from the chaff, to discard what is ascribable to an inescapable mythicizing process, and to make the animal in question appear like it really is.

So, when a Scots crofter says he has seen an *each uisge* (water-horse) or a *kelpie* in a loch; when a Sherpa herdsman asserts that the *yeteh*—the gluttonous bogey-man he conjures up when his children refuse to eat their panada—has been roaming around his hut; when a Scandinavian sailor says his boat passed several times the *soe-orm* (sea-worm) or the immense *kraken*; when an Amazonian Indian alleges he once encountered the *curupira,* the boy-like bush spirit whose feet are turned backwards; when a Nandi stock-breeder in Kenya reports that the dreadful *chemosit,* a one-legged devil, half-man, half-bird, has been raiding his cattle-pen; when a female zootechnician working in Kabarda, U.S.S.R., wonders whether Satan himself did not pay her a nocturnal visit; whenever people, either simple-minded, frightened, terribly upset, or just inclined to sensationalize, recall their encounters with monsters, dragons, devils, demons, trolls, goblins, or fairies, it is just a manner of speech.

Their stories should not be dismissed off-hand as tall tales or figments of the imagination, as some folklorists wearing blinders do (Kirtley 1964, Meurger 1988). Their aprioristic debunking attitude before mythicized phenomena is perfectly absurd, as it should also logically lead them to conclude that anthropoid apes (the "wild men of the woods"), meteorites (curses from heaven), and television (the magic mirror) do not exist but in our imagination.

A Supplement of Circumstantial Proofs

When the detailed identikit-picture of any particular "hidden" animal has at last been completed, further circumstantial evidence supporting its existence can be extracted from the comparison of diverse—but in a way similar—cryptozoological cases.

So, it was by a comparative study of the obviously different types of so-called "sea-serpents" that the author was able to determine that some of them have a worldwide distribution, while others are restricted to certain rather well-defined areas (Heuvelmans 1965: Ch. 13, 1968: Ch. 14). This is, of course, consistent with what we know of other marine animals, and it can shed light on specific physiological characteristics of individual species. It also entails some comforting conclusions. If "sea-serpents" were merely a creation of human imagination, one would expect that they would all be described identically along the lines of just one stereotyped myth, or, alternatively, that they would be described very differently in each country or cultural region, according to local traditions and beliefs.

The case is even more remarkable as far as freshwater "monsters" are concerned. In the 1960's, while collecting additional material for Peter Costello, who was at the time preparing his book *In Search of Lake Monsters* (Costello 1974), it struck me that all such animals were described exactly as my long-necked type of "sea-serpent"—in my opinion, a large, giraffe-necked seal, undoubtedly a huge mammal—when reported from cold, temperate

fjord-like lakes or steep-sided rivers in both the northern and southern hemispheres. Lake "monsters" were described quite differently, and, moreover, heterogeneously, when reported from tropical lakes, rivers, or swamps; to wit, as normal-sized pinnipeds or sirenians, but more often as enormous catfishes or gigantic crocodiles, monitor lizards, and snakes, or even as amphibious dinosaurs of both the Saurischian and Ornithischian orders.

When I plotted on a map the various freshwater bodies involved, it became apparent that *all* the lakes where long-necked mammals with humps had been reported were located around isothermic line 10°C (between 0°C and 20°C) in both the southern and northern hemispheres. This consistency, revealing that the same form of animal had been reported independently in the same ecological niche from different regions of the world, is, of course, the best evidence one could wish for its existence. (I expressed this view for the first time during a British natural history television program introduced by [later Sir] Peter Scott, and transmitted by BBC1 on December 9, 1966.) It is, incidentally, in better conformity with the rules of animal physiology that the obvious reptilian types should have been reported from the warmer regions.

Quite similarly, the present existence, alleged by some cryptozoologists, of at least one form of large carnivorous marsupial on the Australian continent is consistent with ecological principles: such a powerful predator fills a niche which would better maintain a natural equilibrium. And it is for zoogeographical, geological, and paleontological reasons that the cryptic *waitoreke,* the only native mammal which would be dwelling in New Zealand, has a better chance of being an unknown marsupial "otter," or, even better, a new species of monotreme allied to the Australian platypus, than a placental otter (Heuvelmans 1955, 1958).

The Valuation of Material Evidence

Directly contrary to what many laymen and journalists state, it is not true that cryptozoologists cannot produce the slightest material evidence of the existence of the animals with which they are concerned. And I am not referring only to tracks, which some consider just molds—that is, "negatives"—of truly concrete flesh-and-blood animals, and are thus inclined to ignore. This is forgetting that much paleontological material is made up of prints or casts, and that palichnology, i.e., the study of ancient tracks, is now becoming the most promising trend of research for the reconstruction of fossil behavior (Seilacher 1967, Mossman and Sarjeant 1983, Vidal 1987). A leading naturalist, Ernest Thompson Seton, warned us some time ago: "Never forget the trail. . . . It is the priceless, unimpeachable record of the creature's life" (Seton 1958).

There is actually a wealth of physical evidence of various sorts supporting

the reality of some "hidden" animals, namely footprints (*sasquatch, yeti,* Central Asian giant, pygmy *orang pendek* from Sumatra and *batūtūt* from Borneo, Nandi-bear, African "dragons"), outsized sucker-marks on the skins of cetaceans (super-giant squids), photos and motion-picture film footage (Loch Ness and Lake Champlain "monsters," gigantic African snakes, South American "ape," Australia's mainland thylacine, Bigfoot), feces containing unknown parasites (*yeti*), tufts of hair or incomplete skins (unusual British cats, the spotted lion of Kenya, a spotted antelope from Liberia, the North African bear *Ursus crowtheri*), masses of preserved tissue (*Octopus* [or *Otoctopus*] *giganteus*), skulls (the Canadian bear *Vetularctos inopinatus,* the Andean wolf *Dasycyon hagenbecki*), a whole specimen (Mexican *onza,* the pygmy gorilla *Pseudogorilla ellioti,* the surviving Neanderthal from Vietnam *Homo pongoides*), and even, exceptionally, live specimens kept in a zoo (white bear from Central China) (Heuvelmans 1986). However, as mentioned in my definition of cryptozoology, all this material evidence is still controversial, as it is considered insufficient by some.

Material proofs are admittedly not conclusive, as they can be faked, or simply misinterpreted. One does not have to evoke the ominous hoax of Piltdown Man to be convinced of this. The history of zoology, and more especially of paleontology, teems with colossal blunders made by the most distinguished scientists on the strength of objects which had *not* been faked. The bones of the zeuglodont, an archaic whale, where first attributed by Harlan to a huge reptile, which was named *Basilosaurus*; the dagger-like thumb of the iguanodon was, amusingly, placed on its nose in the scientific reconstruction of Gideon Mantell; the monstrous claws of *Chalicotherium,* a peculiar ungulate mammal, were taken by Cuvier, the "father of paleontology," for those of a gigantic pangolin; a pig's molar was thought by Osborn to belong to an American ancestor of man, which he christened *Hesperopithecus,* the "dawn-monkey"; and, not so long ago—the incident has modestly been kept secret—a fragment of a human skull, found in a Mousterian stratum from the Charente, France, was identified as a piece of skull from an extinct tortoise by—*horresco referens*!—a prominent French physical anthropologist, who, significantly, is an avowed enemy of cryptozoological claims.

The sundry items listed above are of very unequal value. Footprints in mud or clay, particularly when they are so distinct as to show dermatoglyphs (Krantz 1983), are, of course, more reliable than footprints in snow. The film by the late Tim Dinsdale, revealing the surface movements of one of the Loch Ness animals, and which was carefully analyzed by experts at the Joint Air Reconnaissance Intelligence Center (JARIC) of the Royal Air Force, is certainly more convincing than the Patterson film showing an alleged Bigfoot with some grievous anatomical inconsistencies. A single skin, a skull,

or even a whole specimen runs the risk of being dismissed as representing an individual variation or a freak, which again stresses the fact that scientific truth is always statistical.

The greatest naivete of beginners in cryptozoology is to imagine that they will definitely solve a case by producing a solid piece of evidence: a very distinct movie, perfect tracks, or, preferably, an acquired specimen. This is simply not realistic; only a large amount of such material proof would actually achieve this. I do not mean to imply that cryptozoologists should not be searching for evidence in the field. What they should be aware of, however, is that it is only when added to both testimonial and circumstantial evidence that autoptical evidence will help them win a case.

The Citation of Precedents

The more convincing precedents a cryptozoologist can cite in support of any case is the long list of major zoological discoveries made during the last centuries and up to the present time.

He or she should first show, by calculating the past rate of discovery of new species in all groups of animals, that this rate, which had been continually increasing for the majority of phyla since the birth of systematic zoology, and reached its peak around the first quarter of the present century, is now decreasing—but rather slowly. At present, more than 5,000 species are still discovered every year. Of these, about 4,000 are new insects, but the number of new vertebrates, which are of greater interest for cryptozoology, is far from being negligible: "Quite recently, in the mid-1970's there were discovered, each year, around 112 new species of fishes, 18 new species of reptiles, about 10 new species of amphibians, the same number of mammals, and 3 or 4 new species of birds" (Heuvelmans 1983b).

This mathematical demonstration of the high hopes which cryptozoologists may entertain for the future, can be supported in an even more striking way by a historical survey listing the most spectacular or astonishing zoological discoveries made in this century. The author has already sketched the broader outlines of this story in a chapter of *On the Track of Unknown Animals* (Heuvelmans 1955, 1958), but he more recently refined this demonstration by providing a rigorous and exhaustive list, although restricted to mammals only. This list does not include mammals weighing less than 80 pounds, new subspecies, or still controverted forms (Heuvelmans 1984).

Similar chronological lists of the most striking new species of birds, reptiles, amphibians, and fishes discovered since the turn of the century would be very welcome, as these precedents would demonstrate that the probability of discovering medium- to large-sized vertebrates of most classes is still high.

Additional precedents, which should be cited whenever incredulity is exhibited concerning the claimed survival nowadays of animals considered long extinct, can easily be gleaned in the rich harvest of so-called "living fossils."

This paradoxical term was coined by Darwin, when, in *The Origin of Species,* he expressed amazement at the existence of such freshwater animals as ganoid fishes (*Polypterus,* sturgeons, gar-pikes, and bowfins), the platypuses, and the South American lungfish *Lepidosiren,* ". . . which, like fossils, connect to a certain extent orders at present widely sundered in the natural scale. These anomalous forms may be called living fossils; they have endured to the present day, from having inhabited a confined area, and from having been exposed to less varied, and therefore less severe, competition" (Darwin 1859).

In a chapter of his first major cryptozoological work (Heuvelmans 1955, 1958), the author attempted to demonstrate that the notion of "living fossils" is a very loose one, and could actually be applied to a tremendous array of life forms. That many supposedly extinct animal species—be they prehistoric men, archaeocetes, or dinosaurs—can be surviving today should not be surprising. This can only surprise people who continue to subscribe to an ancient and obsolete view of the mechanics of evolution, one based upon the naive and anthropocentric concept of the *scala naturae,* which is older than the idea of evolution itself; that is, the concept of "the great chain of beings," so well analyzed in a 1942 book bearing the same title (Lovejoy 1942).

The idea of such a natural ladder, or staircase, leading from the simplest and least organized forms to the most sophisticated ones, was originally linked with the religious belief that man stands not only at the pinnacle of life's creation on earth, but was indeed the very end of it. When the theory of biological evolution gained acceptance, man again became the summit and final outcome of it. There is, however, nothing scientific in such a conclusion, as the premises of the syllogism are purely dogmatic and based upon faith alone. When evolution is represented graphically, the result does not look at all like a ladder, a flight of stairs, or a simple chain, but rather like a thick bush. New forms do not evolve from ancient ones which then automatically disappear, but branch off from them, while the older forms usually persist. This is why there are still representatives today of *all* known zoological phyla, even those thought to be the most "primitive," "archaic," or "inferior."

Animal species, genera, families, and even whole orders rightly considered "living fossils" are so numerous (Delamare-Deboutteville and Botošanéanu 1970) that they can, in a way, be taken as the rule rather than the exception. Only very few classes of animals—or groups of almost equal importance—seem to have entirely disappeared in the past. To wit, the archaeocytes, of dubious affinities but distantly related to the Foraminiferida, the sponges and the cnidarians, the bellerophontids of the phylum Mollusca, the graptolithes, thought until recently to be related to the Pterobranchia and thus belonging to the phylum Hemichordata, and, last but not least, the trilobites, of the phylum Crustacea.

Why these rare—one is justified to state *exceptional*—classes are appar-

ently extinct today, nobody knows for certain. It is even more difficult to understand why numerous orders of animals seem to have vanished entirely, while other, closely related ones are still flourishing. One has only to review the plethora of "scientific" theories, usually of the most extravagant nature, which have been put forth to account for the supposed—at least generally accepted—demise of dinosaurs, the latest craze being an epidemic of comets. It seems that none of the scientists responsible for such lucubrations thought of first asking this very simple question: "How can *any* catastrophic impact wipe out selectively a whole group of animals and leave unscathed all other ones sharing the same habitat or landscape, even their closest relatives?"

The truth is that, just as with individuals, larger or smaller groups of animals eventually die of "old age," from fair wear and tear; that is, from the progressive accumulation of mostly harmless ailments for individuals, and of unfavorable factors of all sorts for species or more comprehensive categories. All the same, when particularly well-adjusted to their respective ecological niches, groups of any class of animals manage to survive much longer than others, as Darwin judiciously surmised. This is what makes "living fossils" so common.

To summarize, what should surprise us is *not* that numerous, supposedly extinct animal species may survive today, but, rather, that so many species—sometimes whole zoological groups—*have* actually disappeared for reasons nobody has ever been able to unequivocally explain.

This should help to rule out the last objection—but also the most common one—which can be raised against some cryptozoological claims.

In concluding, I would like to provide prospective cryptozoologists with some sound advice. First of all, one should always brief one's case very carefully, collecting as much data as possible, and taking one's time (as Molière once put it: "Time does not spare what has been achieved without its help"). Secondly, one should stick to facts, not to faith; to strict logic, not to conventional wisdom. That people, be it scientists, journalists, or laymen, believe or not in the existence of a "hidden" animal is of no importance whatsoever from a zoological perspective, which is the only one of consequence.

Finally, one should not let anybody (debunkers or authorities) nor anything (weariness or despair) interfere with one's determination. Cryptozoological research should be actuated by two major forces: patience and passion.

References Cited

Aarne, Antti
1928 *The Types of the Folk-Tale. A Classification and Bibliography.* Helsinki: Academia Scientiarum Fennica.

Anonymous
1968 *National Maritime Museum. Catalogue of the Library.* Vol. I, *Voyage and Travel.* London: Her Majesty's Stationery Office.

Arvy, Lucie
1978 Comparaison des Gravures de Cétacés de l'âge de Pierre avec les Premiers Dessins de Cétacés Scandinaves. *Zoo d'Anvers,* Vol. 43(3): 46–49.

Bauer, Henry H.
1986 *The Enigma of Loch Ness: Making Sense of a Mystery.* Urbana--Chicago: University of Illinois Press.

Belleforest, François de
1575 *La Cosmographie Universelle de Tout le Monde.* (Vol. I[2], col. 198.) Paris: M. Sonnius.

Broderick, A. Houghton (ed.)
1972 *Animals in Archaeology.* New York: Praeger; London: Barrie and Jenkins.

Campbell, Joseph
1984 *Historical Atlas of World Mythology.* Vol. I, *The Way of Animal Powers.* London: Times Books.

Costello, Peter
1974 *In Search of Lake Monsters.* London: Garnstone; New York: Coward, McCann and Geoghegan.

Cox, Edward Godfrey
1935–38 *A Reference Guide to the Literature of Travel.* Seattle: University of Washington.

Darwin, Charles
1859 *The Origin of Species by Means of Natural Selection.* London: John Murray. Modern Library edition: 81.

Delamare-Deboutteville, Claude, and Lazare Botošanéanu
1970 *Formes Primitives Vivantes, Musée de l'Evolution.* Paris: Hermann.

De Vries, Ad.
1974 *Dictionary of Symbols and Imagery.* Amsterdam: North-Holland Publishing.

Doyle, Arthur Conan
1919 Introduction. *In* J. Arthur Hill, *Spiritualism: Its History, Phenomena and Doctrine.* New York: George H. Doran; London: Cassell.

Faure, Martine
1978 Revision Critique d'une Collection de Gravures Mobiliéres Paléolithique: Les Galets et les os Gravés de la Colombiére (Neuville-sur-Ain, Ain, France). *Nouvelles Archives du Muséum d'Histoire Naturelle de Lyon,* Fasc. 6: 41–99.

Fort, Charles H.
1941 *The Books of Charles Fort.* New York: Henry Holt.

Frazer, James G.
1890 *The Golden Bough: A Study in Magic and Religion.* London: Macmillan (reprinted 1940, New York: Macmillan).

George, Wilma
1969 *Animals and Maps.* Berkeley: University of California Press; London: Secker and Warburg.

Hastings, James (ed.)
1908–22 *Encyclopedia of Religion and Ethics.* Vol. 1, art, *Animals.* Edinburgh: T. & T. Clark.

Heuvelmans, Bernard
1955 *Sur la Piste des Bêtes Ignorées.* Paris: Plon (reprinted 1982, Paris: Francois Beauval; Geneva: Famot).
1958 *On the Track of Unknown Animals.* London: Rupert Hart-Davis; New York: Hill and Wang.
1965 *Le Grand Serpent-de-Mer: Le Problème Zoologique et sa Solution.* Paris: Plon (Revised edition, 1975).
1968 *In the Wake of the Sea-Serpents.* London: Rupert Hart-Davis; New York: Hill and Wang.
1978 *Les Derniers Dragons d'Afrique.* Paris: Plon.

1982 What is Cryptozoology? *Cryptozoology,* Vol. 1: 1–12.
1983a On Monsters: Or How Unknown Animals Become Fabulous Animals. *Fortean Times,* No. 41: 43–47.
1983b How Many Animal Species Remain to be Discovered? *Cryptozoology,* Vol. 2: 1–24.
1984 Cryptozoology is After Both Aquatic and Terrestrial Animals, not to Mention Misinformed Zoologists (Response to Groves). *Cryptozoology,* Vol. 3: 115–18.
1986 Annotated Checklist of Apparently Unknown Animals with which Cryptozoology is Concerned. *Cryptozoology,* Vol. 5: 1–26.
1987a La Criptozoologia: Che Cosa ĕ e Che Cosa non ĕ. *Abstracta,* Vol. 2(12): 68–75.
1987b La Metamorfosi degli Animali Sconosciuti in Bestie Favolose. *Abstracta,* Vol. 2(18): 78–85.

Izzard, Ralph
1955 *The Abominable Snowman Adventure.* London: Hodder and Stoughton.

Janis, Christine
1987 Fossil Ungulate Mammals Depicted on Archaeological Artifacts. *Cryptozoology,* Vol. 6: 8–23.

Keller, Otto
1909–13 *Die Antike Tierwelt.* Leipzig: W. Engelmann.

Kirtley, Bacil F.
1964 Unknown Hominids and New World Legends. *Western Folklore,* Vol. 23(2): 77–90.

Klafkowski, Piotr
1985 Linguistics as a Tool in Cryptozoological Research. Paper presented at the Symposium "Cryptozoology: The Search for Unknown or Supposedly Extinct Animals," III International Congress of Systematic and Evolutionary Biology, July 7, 1985, University of Sussex, Brighton, England.

Koenigswald, G. H. R. von, and Joachim Steinbacher
1986 Fremde Vogel an fernem Ort. *Natur und Museum,* Vol. 116(4): 97–103.

Krantz, Grover S.
1983 Anatomy and Dermatoglyphics of Three Sasquatch Footprints. *Cryptozoology,* Vol. 2: 53–81.

Leach, Maria (ed.)
1949–50 *Standard Dictionary of Folklore, Mythology and Legend.* New York: Funk and Wagnalls (Revised edition 1972).

Lovejoy, Arthur O.
1942 *The Great Chain of Beings.* London: Humphrey Milford; Cambridge, Massachusetts: Harvard University Press (reprinted 1957).

MacCulloch, John Arnott, L. H. Gray, and G. F. Moore (eds.)
1916–31 *The Mythology of All Races.* Boston: Marshall Jones.

Meurger, Michel, with Claude Gagnon
1988 *Lake Monster Traditions: A Cross Cultural Analysis.* London: Fortean Tomes.

Mossman, David J., and William A. S. Sarjeant
1983 The Footprints of Extinct Animals. *Scientific American* (January).

Nissen, Claus
1972 *Die Zoologische Buchillustration.* Stuttgart: Anton Hiersemann.

Oudemans, Antoon Cornelis
1892 *The Great Sea-Serpent.* Leiden: E. J. Brill; London: Luzac.

Parker, Scott
1988 Fortean Research Primer. *Strange Magazine,* Vol. 2: 42–44.

Prat, F.
1968 *Recherches sur les Equidés Pléistocènes en France.* Doctoral thesis No. 226, Faculty of Sciences, University of Bordeaux, Bordeaux.

Seilacher, Adolf
1967 Fossil Behavior. *Scientific American* (August).

Seton, Ernest Thompson
1958 *Animal Tracks and Hunter Signs.* New York: Doubleday.

Thompson, Stith
1932–36 *Motif-Index of Folklore: A Classification of Narrative Elements in Folk-Tales, Ballads, Myths, Fables, Mediaeval Romances, Exempla, Fabliaux, Jest-Books and Local Legends.* Bloomington: Indiana University Studies.

Tylor, Edward B.
1871 *Primitive Culture: Researches Into the Development of Mythology, Philosophy, Religion, Language and Custom.* London: John Murray (reprinted 1958, New York: Harper and Bros.).

Vidal, Jean
1987 La Statistique de'Brouille les Pistes. *Science et Vie,* No. 837: 58–64, 152–53.

Wood, Casey Albert
1931 *An Introduction to the Literature of Vertebrate Zoology.* Oxford: Oxford University Press; London: Humphrey Milford (reprinted 1974, New York: Arno Press).